

ENVIRONMENTAL POLLUTANTS AND HISTOLOGICAL LESIONS IN *GobiUS NIGER* (BLACK GOBY) FROM THE IZMIR BAY OF TURKEY

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Abstract

It is known that heavy metals can accumulate in tissues during aquatic organism growth and often biomagnify up the food chain interfering with the health and reproduction of both wildlife and humans. In the present study, the effects of due to pollution of environmental pollutants on liver of the black goby *Gobius niger* from the Izmir Bay of Turkey were analyzed by histology. The presence of histological lesions in Livers of the fish as result of pollutant exposure was evaluated. There was no important cellular alteration from liver histology except minor pathologies in both clean and dirty area. The absence of lesions in liver may show either detoxification ability of fish or the clearance of Izmir Bay from environmental pollution by recent protection with waste water treatment plant. Keywords: *Gobius niger*, Liver, Pollution, Marine, Histopathology

Keywords : Aegean Sea, Bio-accumulation.

Introduction

At present, heavy metal contamination in aquatic ecosystem is one of the most critical environmental issues. Heavy metals are generally carried by rivers and/or by waste waters. The problem of waste release to the sea is generally associated to heavy metal contamination. These problems become more serious in coastal sediments, where heavy metals accumulate, and nearby towns. In the Mediterranean sea the distribution of dissolved zinc, copper, lead, and cadmium is mainly controlled by their production and release, by hydrodynamic phenomenon and by biological production. Mediterranean sea is highly impacted by heavy metal pollutions. It is known that bioaccumulation of heavy metals can occur in tissues during organism growth and often biomagnify up the aquatic food chain.

We used a marine teleost, the black goby *Gobius niger*, a small species widespread over the Mediterranean. Several *Gobius niger* as a indicator of pollution from the Izmir Bay, a coastal system located on Egean sea were collected between 2004-2005. Many years ago, the presence of pollution with many heavy metals including organochlorine pesticides in sediments because of the absence of waste water treatment was reported (Arinc et al., 2001). The aim of this study was to take part in an integrated environmental evaluation of the Bay through the determination of the histological analysis of Liver to determine possible relationships between pollution and biological effects in *Gobius*. The information generated with this study can be useful in conservation programs for the Bay, which has been declared a refuge for the economic fishes.

Material and Method

*Gobius niger*s were collected at two stations, Bostanlı(dirty) and Urla (clean), along the Izmir Bay of Turkey between 2004-2005. Livers were removed and sections of liver each fish were fixed in 10% formalin solution buffered with sodium phosphate for histological analysis. For histology, tissues were dehydrated and embedded in paraffin. Tissue sections were stained with haematoxylin and eosin.

Results

Fish liver histology has particular characteristic in normal structure. Hepatocytes constitute about 80 percent of the cell population of the liver. The liver has a great number of functions, most of which is performed by the hepatocytes. Light microscope observations show that it is not possible to distinguish hexagonal subdivisions of hepatic parenchyma or lobules. Hepatocytes in fish livers are arranged as tubules or cords. Between the neighboring sinusoids, the hepatocytes are arranged as plates. The hepatic parenchyma of fish is very homogeneous and the hepatocytes are polygonalshaped cells, appearing hexagonal, often weakly basophilic. The cell membrane of individual hepatocytes is clearly visible through light microscopy analysis. Normal liver is pleomorphic. High fat content in hepatocytes with nuclei displaced to the cell periphery. One characteristic for fish liver is different staining properties of hepatocytes in different zones of liver parenchyma.

Most *Gobius* analyzed had none important macroscopic or microscobik histological lesion in both clean and dirty area. Symptoms like lymphocyte infiltration and pycnosis showing toxic insult to liver was found scarcely in a few samples from both clean and dirty area. Liver damage involving cellular degeneration and granuloma, as well as an increase in the number

of hepatocytes and hyperaemia were not found. Cellular alteration foci as preneoplastic lesions or precursors in hepatic neoplasms histogenesis were not seen. Therewas only a parasite infection in one liver from clean area.

Discussion and Conclusion

The present study investigated the pollution effect on the liver of the black goby *G. niger*. Liver being the main site for heavy metal accumulation was used for pollution criteria. The prevalences of hepatic lesions involving cellular alteration registered in this study are not similar to those reported by previous studies (McCain et al. 1988). Among hepatic lesions, the presence of granulomas and tumors was always low in previous studies (Malins et al. (1988) It has been shown that liver hemosiderosis in fish has been associated with the presence of organic pollutants in the environment (Thiyagarajah et al., 1998). The degree of association between contaminants and lesion prevalences, and explained variance, reported in previous studies were different depending on circumstances occurred study area (Malins et al. (1988). Therefore, association between fish histopathologies and the presence of organic pollutants should be carefully studied given the histological lesions observed.

In conclusion, the present study represents an important observation on toxic effect of pollution on fish liver from Izmir bay showing that this is not the case. Pollutants were not associated with the presence of histopathologies in livers. This observation may explaine by either very effective detoxification ability of the fish or cleaning of the bay by the water waste treatment plant. These results could be more meaningful by confirming with water, sediment and in vivo pollutant analyses of fish liver.

References

- 1 - Arinc E, Kocabiyik S, Su E., 2001. Induced CYP1A mRNA, protein and catalytic activity in the liver of feral fish,leaping mullet, *Liza saliens*.Comp Biochem Physiol C Toxicol Pharmacol. Feb;128(2):281-90.
- 2 - Malins, D.C., McCain, B.B., Landahl, J.T., Myers, M.S., Krahn, M.M., Brown, D.W., Chan, S.L. and Roubal, W.T., 1988. Neoplastic and other diseases in fish in relation to toxic chemicals: an overview. *Aquatic Toxicology* 11, pp. 43-67.
- 3 - McCain, B.B., Brown, D.W., Krahn, M.M., Myers, M.S., Clark, R.C., Chan, S. and Malins, D.C., 1988. Marine pollution problems, North American West Coast. *Aquatic Toxicology* 11, pp. 143-162.
- 4 - Thiyagarajah, A., Harley, W.R. and Abdelghani, A., 1998. Hepatic hemosiderosis in buffalo fish (*Ictiobus* spp.). *Marine Environmental Research* 46 1-5, pp. 203-207.